

Parkinson's disease - unlocking the doors to breakthrough treatments



The classic white clapboard and polished windows of the imposing house are straight from the pages of an upscale property magazine. But this elegant home, surrounded by manicured lawns, is wired to beat the scourge of Parkinson's disease.

Behind the front door, everything from refrigerator handles and the kitchen cupboards to the armchairs and double bed are fitted with sensors that respond to subtle changes in movement in patients, a crucial indicator in Parkinson's.

Their readings are sent wirelessly to a command suite just off the

entrance hall where scientists monitor a bank of instruments and collate the information that could tell how a patient's condition is progressing or how they respond to a medication.

Its revolutionary approach could foster giant advances in diagnosing and treating the condition by accelerating clinical trials in a range of disease-modifying drugs in development.

The house, one hour north of Manhattan, is the centre of the multi-million-pound BlueSky Project - a collaboration between industry giants Pfizer and IBM - which is ready to accept its first patient for a

Parkinson's disease clinical trial.

The progressive neurological condition, which is caused by a lack of the brain-signalling chemical dopamine, has five sub-types with 30 separate genetic factors at play and is notoriously difficult to diagnose, while clinical trials are bedevilled by the difficulty of assessing patient impact.

Disease signature

The property, originally a farmhouse built in the early 19th century but swallowed up by IBM's research campus in Yorktown Heights, New York, is now a focal point of the campaign to

turn the tide on Parkinson's.

Patients will be invited to live in the house for specified trial periods with cameras capturing their actions in 3D while sensors on their feet, wrists and chest track 26 different joint movements during everyday tasks such as walking across a room, opening a cupboard or making a cup of coffee. Even the mechanics of how someone gets up and down from a chair or bed can be calibrated and shaped into a personal disease signature.

Research has already shown that Parkinson's patients suffer changes to their gait and movement and

'I believe we are about to see a tsunami of tools and technology to tackle Parkinson's'

Peter Bergethon

the BlueSky team (pictured right) can finesse physical performance indicators to help clinicians diagnose the disease faster or monitor how trial drugs are working.

The project, which has been testing for a year, fuses artificial intelligence and real-time collection of patient data to create a round-the-clock window on to disease symptoms.

"One of the issues we have with Parkinson's is that we cannot monitor the progression accurately which means we cannot test new drugs very effectively," says Dr Beckie Port, of Parkinson's UK. "Clinical trials could have failed in the past not because the drugs have not worked but because we are unable to test them effectively in Parkinson's."

David Gray, senior neuroscientist at Pfizer's Neuroscience Research Centre, adds: "One of the reasons we started BlueSky is that we wanted to show that what we are bringing forward is of substantial benefit and, because we take ideas through to

the end, we have to think about how we are going to demonstrate that.

"To show the stopping of disease progression can take a couple of years and that is a long time to conduct a clinical trial, so we hope we can be more precise and accelerate the process."

Medication

"In many trials, there is single time point of assessment and, when you have good days and bad days, that can be variable. One of the attractive things about wearables is that you can get more data over multiple days - the good and the bad days - and get more of a collective picture with richer data. It also makes it easier and more attractive for people to participate in trials.

"We are swapping trials stretching over multiple years with many participants to maybe a six-month trial with fewer participants. This is a turning point for Parkinson's."

The success of BlueSky is important for both companies. For IBM, it signposts how their technology could work in clinical trials and how it may perform in the home to improve symptom control and generate warning signals to show when medication is wearing off. For Pfizer, it creates a testing arena for its multiple research strands into Parkinson's including its compound, PF-06649751, which is expected to enter Phase III trials in 2019.

"Our research is exciting but it's at a fairly early stage. We are looking at genetic clues that tell us things about a person's susceptibility to getting

Parkinson's and examining those pathways," adds Dr Gray.

"We don't understand that fully but we



can make some potential guesses using genetic evidence. There might be a mutation that confers a higher risk and that can be examined.

"The potential to personalise the therapy is what is really exciting. We know people respond differently to medication and present with different symptoms. There are clearly some breakthroughs to help us understand that, which affords us hope that we will be able to customise therapies to an individual's biology."

Tsunami of tools

Peter Bergethon, Pfizer's head of quantitative medicine, says: "We are at the point where the questions that we need to know are quite evident and that drives us forward quickly. The scientific community is very good when you pose question after question that are testable.

"I believe we are about to see a tsunami of tools and technology to tackle Parkinson's and that is exciting. The future is extraordinarily promising."

The IBM team is also confident that BlueSky will create a paradigm shift for Parkinson's and Ajay Royyuru, the company's vice-president of healthcare and life sciences, adds: "Until now, healthcare has only been episodic. Your caregiver can only get data during that episode of interaction during your appointment. With continuous measurement and improved data, we can take personalised care to a new level."

Parkinson's will continue to confound healthcare professionals for a long time yet and a cure remains distant but Rachel Dolhun, a movement disorder specialist with the Michael J Fox Foundation, observes:

"We are in a new era where

genetics are leading us towards targeted treatments and technology is providing increased data collection and knowledge. We have many reasons to feel hopeful right now."

The BlueSky project has added drive as many members of both the IBM and Pfizer teams have relatives with Parkinson's such as Jeremy Rice, principal researcher and senior manager at IBM Research, whose 83-year-old father Roger was diagnosed with Parkinson's 18 months ago. "This is very personal for me. It is a scary thing and if you only go to the doctor every six months with your Parkinson's it is very episodic so it would be reassuring to be able to track it continuously," he says.

"The project excites me because there is so much that tech can assist people with and help make their lives better. A lot of us on the team have relatives with Parkinson's and it is troubling to see what it does to them so this is very important to us. Our work gives tremendous hope for Parkinson's and also other cognitive conditions such as Alzheimer's, if we can broaden the technology in the future."

And the importance of accelerating results in a condition area that has seemed to be at a standstill was brought home to Dr Gray when he met an old family friend who had been diagnosed. "He knew I was involved in Parkinson's research and he came across to me, grabbed my hand and said one word: 'Hurry'."

Danny Buckland is a health journalist

Below: Peter Bergethon

